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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/816,089	03/31/2004	Chien-Chao Huang	67,200-1223	9487

7590 09/30/2005

TUNG & ASSOCIATES  
Suite 120  
838 W. Long Lake Road  
Bloomfield Hills, MI 48302

EXAMINER
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PIZARRO CRESPO, MARCOS D

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 09/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/816,089	Applicant(s) HUANG ET AL. 	
	Examiner Marcos D. Pizarro-Crespo	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 26 August 2005.  
 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.  
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-39 is/are pending in the application.  
     4a) Of the above claim(s) 6-20 and 31-39 is/are withdrawn from consideration.  
 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
 6) ☒ Claim(s) 1-5 and 21-30 is/are rejected.  
 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
 8) ☒ Claim(s) 1-39 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some \* c) ☐ None of:  
         1. ☐ Certified copies of the priority documents have been received.  
         2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
         3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
     \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

Attorney's Docket Number: 67,200-1223

Filing Date: 3/31/2004

Claimed Foreign Priority Date: none

Applicant(s): Huang, et al.

Examiner: Marcos D. Pizarro-Crespo

### **DETAILED ACTION**

This Office action responds to the election filed on 8/26/2005.

#### ***Election/Restrictions***

1. Applicants' election with traverse of species 1 as reading on claims 1-5 and 21-30 in the reply filed on 8/26/2005 is acknowledged. Claims 31-39 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim.
2. Applicants' traversal is on the ground that species 1 and species 2 are not different species because they both show a gate structure having a double-layered sidewall spacer formed of oxide and nitride and source-drain extension (SDE) regions extending beyond the maximum width of the spacers. This is not found persuasive.
3. As indicated in paper no. 0705, species 1 reads on figure 1F whereas species 2 reads on figure 2E. As seen in the figures, the species include mutually exclusive characteristics that make them patentably distinct from each other. That is, the unpatentability of one of the species would not necessarily imply unpatentability of the other. Species 2, for example, include the deposition of an uppermost oxide layer forming an additional oxide portion to the double-layered spacer of species 1. This will

result in *all* the sidewalls of the oxide and nitride portions of the oxide/nitride spacers of species 2 having substantially vertical portions. The nitride portion of the oxide/nitride spacers of species 1, on the other hand, has a rounded sidewall.

4. As noted in MPEP § 808.01(a), an election of species is proper if the species are considered patentable (unobvious) over each other. On the other hand, such an election should not be required if there is an express admission by the applicants that the species are considered clearly unpatentable (obvious) over each other. *In re Lee*, 199 USPQ 108 (Comm'r Pat. 1978).

5. The applicants have failed to submit or identify any evidence showing the species to be obvious variants or clearly admit on the record that this is the case. In addition, each of the different species would require separately searching for each of their mutually exclusive characteristics. That is, each of the species will require searching a separate subject of inventive effort.

6. For all of the above reasons, the requirement is still deemed proper and is therefore made FINAL.

### ***Drawings***

7. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters **18A** (see, e.g., par.0020/II.12) and **18B** (see, e.g., par.0021/II.10) have both been used to designate nitride spacer portion.

8. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character **18B** has been used to designate both an oxide spacer

portion (see, e.g., par.0020/ll.12-13) and a nitride spacer portion (see, e.g., par.0021/ll.10).

9. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 112***

10. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

11. Claims 4 and 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

12. Claim 4 recites the limitation "the polysilicon gate structure" in line 2. There is insufficient antecedent basis for this limitation in the claim.

***Claim Rejections - 35 USC § 102***

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

14. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Miyanaga (JP 11-233769).

15. Regarding claim 1, Miyanaga shows (see, e.g., fig. 6C) all aspects of the instant invention including a semiconductor device comprising:

- A substrate **300** having a surface orientation of (100)
- A gate electrode **301** formed on the substrate **300**
- A slim spacer formed on top of the substrate (see, e.g., fig. 5C)
- A source-to-drain axis formed along the (100) (see, e.g., col.5/ll.62-66)

16. Claims 21, 24, and 28-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Huang (US 6140192).

17. Regarding claim 21, Huang shows (see, e.g., fig. 4F) all aspects of the instant invention including a CMOS structure comprising:

- A semiconductor substrate **500**
- A gate structure overlying the substrate **500** and comprising a polysilicon electrode **506**
- Spacers adjacent to each side of the electrode **506** and comprising an oxide/nitride portion **506/514a**

– Source/drain extension (SDE) regions **508** comprising the substrate **500** wherein the SDE regions extend beyond a maximum width of the spacers.

18. Regarding claim 24, Huang shows (see, e.g., fig. 4F) the structure further comprising silicide portions **530** comprising a portion of the SDE doped regions.

19. Regarding claim 28, Huang shows the oxide portion **506** comprising CVD silicon oxide (see, e.g., fig. 4F).

20. Regarding claim 29, Huang shows the nitride portion **514a** comprising CVD silicon nitride (see, e.g., fig. 4F).

21. Regarding claim 30, Huang shows the spacers comprising substantially vertical sidewalls (see, e.g., fig. 4F).

### ***Claim Rejections - 35 USC § 103***

22. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

23. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

24. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyanaga in view of Cabral (US 6927117).

25. Regarding claim 2, Miyanaga shows most aspects of the instant invention (see, e.g., paragraph 15 above). Miyanaga, however, fails to specify the width of the spacers. Cabral, on the other hand, teaches that the width of Miyanaga's spacers must be wide enough to avoid encroachment of the source/drain silicide contacts underneath the edges of the gate electrode. Said width should be less than about 400 angstroms (see, e.g., Cabral/col.5/ll.59-62).

It would have been obvious at the time of the invention to one of ordinary skill in the art to have Miyanaga's spacers to be less than about 400 angstroms wide, as suggested by Cabral, to avoid encroachment of the source/drain silicide contacts underneath the edges of the gate electrode.

26. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyanaga in view of Mikagi (US 6566254).

27. Regarding claim 3, Miyanaga shows most aspects of the instant invention (see, e.g., paragraph 15 above). Miyanaga also teaches using a 0.18 $\mu$ m wiring design rule (see, e.g., col.1/ll.63), thereby the length of the gate electrode is 180 nm (see, e.g., col.8/ll.11). Mikagi, on the other hand, talks about the tendency in the semiconductor industry of increasing fineness in semiconductor devices that become finer in dimension (see, e.g., col.1/ll.22-25). More specifically, the dimensions of gate electrodes become



finer and finer (see, e.g., col.1/ll.26-27). As an example, Mikagi shows a gate electrode of about 100 nm wide (see, e.g., col.4/ll.11).

In spite of the above, Miyanaga and Mikagi both fail to show the claimed gate length of less than about 80 nm. The specification, on the other hand, fails to provide teachings about the criticality of having a gate length of less than about 80 nm. However, differences in thicknesses will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such thicknesses are critical. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the workable ranges by routine experimentation". *In re Aller*, 220 F.2d 454,456,105 USPQ 233, 235 (CCPA 1955).

Since the applicants have not established the criticality (see next paragraph) of the claimed gate length and since similar gate lengths are in common use in similar devices in the art (see, e.g., Mikagi/col.4/ll.11), it would have been obvious to one of ordinary skill in the art to use these values in the device of Miyanaga.

#### CRITICALITY

28. The specification contains no disclosure of either the critical nature of the claimed gate length or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

29. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyanaga in view of Ito (US 6656853).

30. Regarding claim 4, Miyanaga shows most aspects of the instant invention (see, e.g., paragraph 15 above). Miyanaga also shows a dielectric layer **427** over the gate electrode and spacer (see, e.g., fig. 6C) but fails to show that the layer is in one of

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tensile and compressive stress. In a similar device to Miyanaga, Ito teaches that using a tensile-stress dielectric layer over gate and spacers would ensure the good performance of Miyanaga's device (see, e.g., Ito/col.7/ll.15-25).

It would have been obvious at the time of the invention to one of ordinary skill in the art to use Ito's tensile-stress dielectric layer over Miyanaga's gate and spacers to ensure the good performance of the device.

31. Regarding claim 5, Ito shows the dielectric layer is a silicon nitride layer (see, e.g., col.7/ll.23).

32. Claims 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang in view of Ito.

33. Regarding claim 22, Huang shows most aspects of the instant invention (see, e.g., paragraph 17 above), except for at least one dielectric layer in one of tensile and compressive stress overlying the gate structure and spacers. In a similar device to Huang, Ito teaches that using a tensile-stress dielectric layer over Huang's gate and spacers would ensure the good performance of the device.

It would have been obvious at the time of the invention to one of ordinary skill in the art to use Ito's tensile-stress dielectric layer over Huang's gate and spacers to ensure the good performance of the device.

34. Regarding claim 23, Ito shows the dielectric layer is a silicon nitride layer (see, e.g., col.7/ll.23).

35. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Huang in view of Mikagi.

36. Regarding claim 25, Huang shows most aspects of the instant invention (see, e.g., paragraph 17 above). Huang also teaches that due to the tendency in the industry to increase the integration of elements in integrated circuits, the line widths and geometries of semiconductor devices have been reduced (see, e.g., col.1/ll.15-20,55-60). Although Huang teaches about the importance of reducing line widths to increase element integration, he fails to specify the length of the gate. The specification, on the other hand, fails to provide teachings about the criticality of having the claimed gate length of less than about 80 nm. However, differences in thicknesses will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such thicknesses are critical. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the workable ranges by routine experimentation". *In re Aller*, 220 F.2d 454,456,105 USPQ 233, 235 (CCPA 1955).

Since the applicants have not established the criticality (see paragraph 28 above) of the claimed gate length and since similar gate lengths are in common use in similar devices in the art (see, e.g., Mikagi/col.6/ll.38), it would have been obvious to one of ordinary skill in the art to use these values in the device of Huang.

37. Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang in view of Cabral.

38. Regarding claims 26 and 27, Huang shows most aspects of the instant invention (see, e.g., paragraph 17 above). Huang, however, fails to specify the maximum width of the spacers. Cabral, on the other hand, teaches that the width of Huang's spacers must be wide enough to avoid encroachment of the source/drain silicide contacts underneath

the edges of the gate electrode. Said width should be less than about 400 angstroms (see, e.g., Cabral/col.5/ll.59-62).

It would have been obvious at the time of the invention to one of ordinary skill in the art to have Huang's spacers to be less than about 400 angstroms wide, as suggested by Cabral, to avoid encroachment of the source/drain silicide contacts underneath the edges of the gate electrode.

### ***Conclusion***

39. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be faxed to Art Unit 2814 via the Art Unit 2814 Fax Center. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(571) 273-8300**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.

40. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Marcos D. Pizarro-Crespo** at **(571) 272-1716** and between the hours of 9:30 AM to 8:00 PM (Eastern Standard Time) Monday through Thursday or by e-mail via [Marcos.Pizarro@uspto.gov](mailto:Marcos.Pizarro@uspto.gov). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy, can be reached on (571) 272-1705.

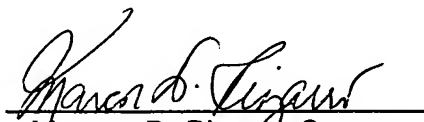
41. Any inquiry of a general nature or relating to the status of this application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or

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Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

42. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/288, 344, 382-384, 408 257/412, 413, 638-640, 649, 900	9/21/2005
Other Documentation:	
Electronic Database(s): EAST (USPAT, EPO, JPO)	9/21/2005

  
Marcos D. Pizarro-Crespo  
Patent Examiner  
Art Unit 2814  
571-272-1716  
[marcos.pizarro@uspto.gov](mailto:marcos.pizarro@uspto.gov)